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pad to exhibit a shielding function against electromagnetic waves.

Please add new claim 20 as follows.

--20. (New) A connector for a module that connects the module, the module having a semiconductor chip mounted on a rectangular board and a conductive pad on a front side of the board, to a printed circuit board in a position wherein the board plane is substantially parallel to the printed circuit board,

said connector comprising:

5  
a connector body having a receiving part that extends along the front side of the module being in a connection position and a groove provided in a rear face thereof into which the front side of the module is inserted, said groove having contacts provided therein which contact the conductive pad on both the face and back of the module when the module is placed in an insertion/withdrawal position while allowing the pad to shift in a direction of insertion/withdrawal when the module is in the insertion/withdrawal position in which the rear side is at a higher level than in the connection position, and having a supporting part that extends rearward from the receiving part to support a left side, a right side and a bottom of the module in the connection position;

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a metallic cover that is put over and is engaged to the connector body to sandwich the module between said metallic cover and the supporting part to thereby maintain the module in the connection position, said metallic cover including a window for exposing the semiconductor chip when the module is placed in the connection position, and a heat sink which contacts the semiconductor chip to dissipate heat therefrom,

wherein at least one of said metallic cover and said heat sink covers said contacts and the conductive pad to exhibit a shielding function against electromagnetic waves.--

REMARKS

Applicants wish to thank the Examiner for the very thorough consideration given the present application. The Office Action of **December 20, 2000**, has been received and its contents carefully noted. Applicants respectfully submit that this response is timely filed.

*[Handwritten signature]*

Claims 1-19 were pending in the present application prior to the aforementioned amendment. Due to the above actions, claims 1, 4, 5, 6, 8-11, 13, 15, 16, 17 and 19 have been amended and new claim 20 has been added to better encompass the full scope and breadth of the invention notwithstanding, Applicants believe that the claims would have been allowable as originally filed. Accordingly, Applicants assert that no new matter has been added and that the claims have not been narrowed within the meaning of *Festo*. Accordingly, claims 1-20 are now pending herein, and, for the reasons set forth in detail below, are believed to be in condition for allowance.

Initially, the Office Action objects to the specification for containing various informalities. In response thereto, page 6, lines 19 and 20 of the specification have been corrected to recite --Fig. 3A--. In order to overcome the ambiguity in the Brief Description of the Drawings, the recitation "along a plane that faces the front and the rear" has been removed. Accordingly, Applicants respectfully request consideration and withdrawal of the aforementioned objections.

The Office Action objects to the specification for failing to provide proper antecedent basis for the claimed subject matter. Applicants respectfully traverse this objection in contending that the specification supports the claimed subject matter recited in claims 7, 8, 12, 13, 18 and 19. For example, page 12, line 14 recites that "tabs 226 contact the top of the board 110 of the module 100", while page 16, lines 14-24 recite that "The bottom of heat sink 241 is fixed to the tabs 226". Therefore, on the basis of this structural interconnection, one skilled in the art can at least infer that the "contacting part", i.e., the tabs 226, "is provided with a heat sink." Accordingly, Applicants respectfully request consideration and withdrawal of the aforementioned objections.

The Office Action objects to the drawings illustrated in Figs. 1, 2, 3B and 4B for containing an informality. In response thereto, Applicants file concurrently herewith a *Request for Drawing Change Approval* to correct Figs. 1, 2, 3B and 4B as shown in red ink and as suggested by the Examiner. In particular, Figs. 1, 2, 3B and 4B have been corrected so that the lead line points to the window. Accordingly, Applicants respectfully request consideration and withdrawal of the aforementioned objections.

The Office Action rejects claims 1, 4, 5, 8-11, 13, 15 and 16 under 35 U.S.C. §112, second paragraph as being indefinite. In response thereto, claims 1, 4, 5, 8-11, 13, 15 and 16 have been

amended to provided proper antecedent basis. For example, claim 1 has been amended so that the recitation "approximately", recites --substantially--, and the recitation "the front side", recites --a front side--. In addition, claims 4, 9 and 15 have been amended so that the limitation "a front-rear direction", recites --a front-rear direction--. Accordingly, Applicants respectfully request consideration and withdrawal of the aforementioned objection.

The Office Action rejects claims 1-4, 9, 14 and 15 under 35 U.S.C. §103(a) as being unpatentable over *Tondreault* (U.S. Patent 5,769,668) in view of *Hopfer* (U.S. Patent 5,761,036), claims 5, 6, 10, 11, 16, and 17 under 35 U.S.C. §103(a) as being unpatentable over *Tondreault '668* and *Hopfer '036* in view of *Scheingold et al.* (U.S. Patent 3,877,064), and claims 7, 8, 12, 13, 18 and 19 under 35 U.S.C. §103(a) as being unpatentable over *Tondreault '668* and *Hopfer '036* in view of *Buller et al.* (U.S. Patent 4,978,638). These grounds for rejection are respectfully traversed for the following reasons and favorable consideration is requested in view thereof.

The claimed invention is directed to a connector comprising a connector body having a receiving part for receiving a front side of the module when the module is placed into a connection position, the receiving part including a rear face provided with a groove into which the front side of the module is inserted. Contacts are provided in the groove to contact the conductive pad on both an upper and lower side thereof when the module the module is inserted into the groove while allowing the conductive pad to shift in a direction of insertion/withdrawal, and a metallic cover that is put over and is engaged to the connector body to sandwich the module between itself and the supporting part and keep the module in the connection position. Moreover, as recited in the claimed invention (See also, Fig. 2), the metallic cover is provided with contact parts which contact the top of the module to transmit the sandwiching force of the metallic cover to the module. The contact parts are provided with a heat sink which contacts the semiconductor chip to dissipate heat therefrom. In addition, at least one of the metallic cover and the heat sink (i.e., contact parts) covers the contacts and the conductive pad of the module to exhibit a shielding function against electromagnetic waves.

As the Examiner well knows, three criteria must be met to establish a *prima facie* case of obviousness. *M.P.E.P.* §2143. First, there must be some teaching, suggestion, or motivation to

combine or modify the teachings of the prior art to produce the claimed invention, found either in the references themselves or in the knowledge generally available to a skilled artisan. *In re Fine*, 837 F.2d 1071, 5 USPQ.2d 1596 (Fed. Cir. 1988). Second, there must be a reasonable expectation of success. *In re Rhinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976). Third, the prior art must teach or suggest all the claim limitations. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).

Applicants respectfully submit that a *prima facie* case of obviousness has not been set forth in the Office Action in rejecting claims 1-4, 9, 14 and 15 as being unpatentable over *Tondreault* in view of *Hopfer et al.* More particularly, the proposed *Tondreault* modifications fail to expressly teach or inherently describe every feature necessary to render the claimed invention obvious. For instance, while the base reference *Tondreault* appears to disclose a connector body having a receiving part 14 with a contact 20 provided in a groove, there is a lack of motivation in *Tondreault* to modify its teachings to combine the metallic cover of *Hopfer et al.* with the connector body to thereby support a case of obviousness under §103. This is more evident when taken into account that *Tondreault* provides a connector with just a single part (i.e., the connector body), and fails to disclose, either expressly or implicitly, that the connector may be modified to include a second part or cover. Specifically, independent claim 1 recites a connector body having a receiving part and a groove having contacts provided therein which contact the conductive pad on both the face and back of the module when the module is placed in an insertion/withdrawal position and a supporting part which supports the sides and bottom of the module. Further, the connector includes a metallic cover over and engaging the connector body to sandwich the module between the cover and the supporting part to keep the module in the connection position.

The essence of the *Tondreault* disclosure is the presence of alignment clips which bias against the module and retain the module in place. Clearly, one of ordinary skill in the art would not turn to the teachings of *Hopfer et al.* as suggested by the Examiner in that such inclusion of a metallic cover is clearly not necessary nor desired in the device of *Tondreault*. Consequently, the Examiner's conclusion that "it would have been obvious to a person skilled in the art at the time the invention was made to use a cover as taught by *Hopfer et al.* to keep the module from moving from the connecting position" is inaccurate in that *Tondreault* already includes a retention mechanism by



way of the clips set forth therein. The cover of *Hopfer et al.* would be considered redundant and unnecessary for inclusion in the *Tondreault* device by one of ordinary skill in the art. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection of independent claim 1 as well as those claims which depend therefrom based upon the inappropriate modification of *Tondreault* in view of *Hopfer et al.*

Regarding the rejection of claims 5-8, 10-13, and 16-19 as with the *Hopfer et al.* reference, there is clearly no modification found in the references to do away with the clip retention mechanism of *Tondreault* and turn to the use of a metallic cover as recited by Applicants' claimed invention. Further, while *Scheingold et al.* appears to disclose a bracket 28 for securing an IC package to a frame 10, there can be found no expressed or implicit disclosure in *Scheingold et al.* that suggests that the bracket 28 includes a heat sink. While the Office Action states that element 62 is a heat sink, which is so described in the publication, this element is not structurally interconnected with the bracket 28 or frame 10. In fact, element 68 is expressly described as forming part of the IC package 60, and not the frame 10. (Col. 2, lines 31-39; Fig. 3). Moreover, neither *Scheingold et al.* or *Buller et al.* expressly teach or inherently describe a connector wherein at least one of the metallic cover and the heat sink covers the contacts and the conductive pads of the module to exhibit a shielding function against electromagnetic waves. Accordingly, Applicants respectfully request reconsideration and withdrawal of this rejection.

Moreover, as noted hereinabove, there is a lack of suggestion as to why a skilled artisan would use any one of the proposed *Tondreault* modifications to achieve the unobvious advantages first recognized by Applicants. The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990).


Applicants respectfully submit that the claimed invention yields unobvious advantages not present in the prior art. A first advantage of the connector is that it offers a heat-dissipating function. Because of the high operating speeds of conventional semiconductor chips, excessive heat is generated which results in elastic deformation of the connectors. This results in loss of the engaging function of the connectors which in turn, causes defective connection and/or disconnection of the



module. In view of the foregoing problem, Applicants have provided the connector with a metallic cover which obviates the problems in the prior art. In particular, the metallic cover of the claimed invention provides protection against elastic deformation due to the excessive thermal stress caused by the operation of the modern-day semiconductor. For instance, in cases in which the connector body is subjected to thermal load caused by the operation of the semiconductor chip, the metallic cover reduces the harsh effects resulting therefrom by dissipating heat away from the module at its contact portions. This heat-dissipating capability provides enhanced reliability in the connection between the connector and module, even in situations in which excessive heat is generated by the semiconductor chip. Applicants respectfully submit that none of the proposed *Tondreault* modifications set forth such an unobvious advantage.

A second advantage of the module is that it offers a shielding function against electromagnetic waves, this feature being specifically set forth in dependent claims 6, 8, 11, 13, 17 and 19, as well as new independent claim 20. Conventionally, circuit instability is a problem in as a result of the connector and module being exposed to the effects of ambient electromagnetic waves caused by the operation of the semiconductor. Applicants have found, however, that by providing a metallic cover for covering both the connector body (i.e., the contacts) and the conductive pad of the module, a shielding function is provided which protects the connector body and the module against the effects of electromagnetic waves. Consequently, such a feature offers stabilization in the operation of the circuits. Applicants respectfully submit that none of the proposed *Tondreault* modifications set forth such an unobvious advantage.

Applicants submit that newly added claim 20 sets forth exemplary features which are patentably distinct over the prior art of record. More particularly, claim 20 recites a connector comprising a metallic cover that is put over and is engaged to a connector body to sandwich the module between the metallic cover and a supporting part of the connector to thereby maintain the module in a connection position, the metallic cover including a window for exposing the semiconductor chip when the module is placed in the connection position, and a heat sink which contacts the semiconductor chip to dissipate heat therefrom, and whereby at least one of the metallic cover and the heat sink covers the contacts and the conductive pad to exhibit a shielding function




against electromagnetic waves. As mentioned hereinabove, these features are not expressly disclosed or implicitly suggested in any of the proposed *Tondreault* modifications.

Since each of the proposed *Tondreault* modifications fail to teach, disclose or reasonably suggest each and every feature of the claimed invention, and fail also to disclose the unobvious advantageous properties first recognized by Applicants, it is respectfully submitted that the combined prior art references fail to render the claimed invention obvious. Accordingly, Applicants respectfully request that the §103 rejections of the pending claims be reconsidered and withdrawn in view thereof.

Accordingly, it is respectfully requested that the claimed invention as set forth in claims 1-19 be passed to issue. Should the Examiner believe a further conference would be of benefit in expediting the prosecution of the instant application, he is hereby invited to telephone counsel to arrange such a conference.

Respectfully submitted,

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DRS/TAV/wks



**Marked up copy of amended claims**

1. (Amended) A connector for a module that connects [a] the module, the module having [which has] a semiconductor chip mounted on a rectangular board and [has] a conductive pad on [the] a front side of the board, to a printed circuit board in a position wherein the board plane is [approximately] substantially parallel to the printed circuit board,

said connector [for module,] comprising:

a connector body having a receiving part that extends along the front side of the module being in [the] a connection position and [is] a groove provided in [the] a rear face thereof [with a groove] into which the front side of the module is [to be] inserted, said groove having [a] contacts [contact that is] provided [in the groove of the receiving part and] therein which contact [contacts] the conductive pad on both the face and back of the module when the module is placed in an insertion/withdrawal position while allowing the pad to shift in [the] a direction of insertion/withdrawal when the module is in the insertion/withdrawal position in which the rear side is at a higher level than in the connection position, and having a supporting part that extends rearward from the receiving part to support [both the] a left side, [and] a right [sides] side and [the] a bottom of the module [being] in the connection position; and

a metallic cover that is put over and is engaged to the connector body to sandwich the module between [itself] said metallic cover and the supporting part [and keep] to thereby maintain the module in the connection position.

4. (Amended) A connector for module according to claim 2 wherein  
said connector body or said metallic cover is provided with a positioning mechanism that positions the module in [the] a front-rear direction when the module is set into the connection position.

5. (Amended) A connector for module according to claim 4 wherein  
[said] a window is [opened] provided in said metallic cover to expose the semiconductor chip





of the module being in the connection position, and in this window a heat sink that will contact said semiconductor chip is connected to the metallic cover.

6. (Amended) A connector for module according to claim 5 wherein at least one of said metallic cover and said heat sink covers [a conductive member] said contacts and the conductive pad to exhibit [the] a shielding function against electromagnetic waves.

8. (Amended) A connector for module according to claim 7 wherein at least one of said metallic cover and said heat sink covers [a conductive member] said contacts and the conductive pad to exhibit [the] a shielding function against electromagnetic waves.

9. (Amended) A connector for module according to claim 3 wherein either said connector body or said metallic cover is provided with a positioning mechanism that position the module in [the] a front-rear direction when the module is set in connection position.

10. (Amended) A connector for module according to claim 9 wherein [said] a window is [opened] provided in said metallic cover to expose the semiconductor chip of the module being in the connection position, and in this window a heat sink that will contact said semiconductor chip is connected to the metallic cover.

11. (Amended) A connector for module according to claim 10 wherein at least one of said metallic cover and said heat sink covers [a conductive member] said contacts and the conductive pad to exhibit [the] a shielding function against electromagnetic waves.

13. (Amended) A connector for module according to claim 12 wherein at least one of said metallic cover and said heat sink covers [a conductive member] said contacts and the conductive pad to exhibit [the] a shielding function against electromagnetic waves.

15. (Amended) A connector for module according to claim 14 wherein said connector body or said metallic cover is provided with a positioning mechanism that positions the module in [the] a front-rear direction when the module is set into the connection position.

16. (Amended) A connector for module according to claim 15 wherein [said] a window is [opened] provided in said metallic cover to expose the semiconductor chip of the module being in the connection position, and in this window a heat sink that will contact said semiconductor chip is connected to the metallic cover.

17. (Amended) A connector for module according to claim 16 wherein at least one of said metallic cover and said heat sink covers [a conductive member] said contacts and the conductive pad to exhibit [the] a shielding function against electromagnetic waves.

19. (Amended) A connector for module according to claim 18 wherein at least one of said metallic cover and said heat sink covers [a conductive member] said contacts and the conductive pad to exhibit [the] a shielding function against electromagnetic waves.

**MARKED-UP COPY OF SPECIFICATION CHANGES**

*Page 6, paragraph beginning "Fig. 6":*

Fig. 6 is a sectional view of one supporting part, which is in the state of Fig. [3] 3A, along a plane that faces the front and the rear.

*Page 6, paragraph beginning "Fig. 8":*

Fig. 8 is a sectional view of the second embodiment of the connector with [a] the module fitted [along a plane that faces the front and the rear].

*Page 7, paragraph beginning "Fig. 11":*

Fig. 11 is a sectional view of the fourth embodiment of the connector with the module fitted [along a plane that faces the front and the rear].

*Page 7, paragraph beginning "Fig. 13":*

Fig. 13 is a sectional view of the fifth embodiment of the connector with the module fitted [along a plane that faces the front and the rear].

*Page 7, paragraph beginning "Fig. 15":*

Fig. 15 is a sectional view of the sixth embodiment of the connector with the module fitted [along a plane that faces the front and the rear].